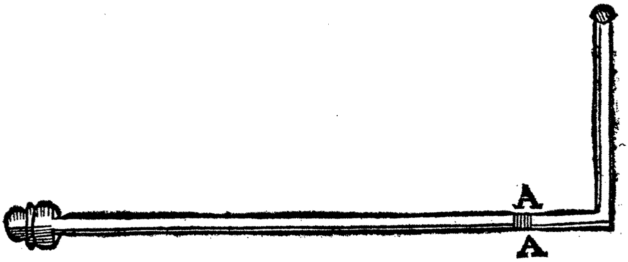

III. *An Account of an Experiment touching the different Denſities of the Air, from the greateſt Natural Heat, to the greateſt Natural Cold in this Climate. By Mr.* Fr. Hauksbee, *F. R. S.*

I Took a Glaſs Tube about 2 Feet in length, and near two tenths Diameter; which at about 6 Inches from one end, I bent in form of a Syphon, as repreſented by the Figure: at whoſe end, which was fartheſt diſtant from the Angle, I cemented on a Braſs Screw with a ſmall Perforation in it; by which means, when I put a little Quickſilver into the ſhorter Leg, I could by declining the Tube, or longeſt Leg, bring it to reſt any where; as ſuppoſe at A A. the ſuperfluous Air within paſſing the premention'd Perforation. Then ſcrewing a Cap on it, the Mercury was detain'd in the ſame Place, and poſſeſt in length about half an Inch. In this manner it was convey'd into a Wooden Trough, with a Thermometer: Then putting in as much warm Water as would cover its Ball, the Syphon lying at Bottom in an Horizontal Poſition,



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Poſition, its ſhorter Leg appearing above the Water, (which was purpoſely ſo contriv'd to prevent any Inconvenience that might ariſe by the Waters getting into it, and to give a free liberty for the preſſure of the outward Air to exerciſe its full power.) When the Spirit of Wine had aſcended by the heat of the Water into its ſmall Ball on top, which I thought was neceſſary, that I might make my Obſervations with the more exactneſs upon its Deſcent; ſuppoſing by that time it ſhould fall to the Degree deſign'd to begin at, that the Spirit in the Ball, would haue receiv'd an equal Degree of heat in all its Parts. Accordingly I began my Obſervations, when it had deſcended to 130 Degrees above the Freezing Point; at which time, I found the length of the Column of Air, from the cloſed end of the Syphon, to the neareſt Surface of the Quickſilver, to be juſt 144 tenths of of Inches. After the Spirit had deſcended 10 Degrees lower, the Air, which before poſſeſs'd 144 Parts, lack'd one of them now; and ſo on ſucceſſively at every 10 Degrees deſcent of the Spirit, the Column of the contain'd Air was leſſen'd in its length one exact tenth. When it had deſcended to 30 Degrees above the Freezing Point, the Air was found to poſſeſs but 134 of the prementioned Parts: So that from hence it will be eaſie to conclude, that at the Freezing Point, the Air in the Syphon would be reduc'd to 3 tenths leſs than the laſt Obſervation. And conſequently at 50 Degrees below the Freezing Point, (which I am informed is the greateſt degree of Cold that has happen'd in our Climate,) it would be reduc'd to 126 Parts of the whole, and in that ſtate would be one eighth more denſe than when at the greateſt Degree of our Natural Heat: and the Reaſon why I could not prove this latter part by Experiment was, that when I came to expoſe the Thermometer and Syphon in the open Air, or Freezing Mixture, the Syphon would inſtantly

ſtantly receive the Impreſſion of the Cold, and the Air contain'd in it be conſiderably contracted, before the Thermometer gave any ſign of ſuch Alteration. But ſeeing the former part of the Experiment ſucceeded ſo exactly regular, I think there can be no doubt of the truth of the whole Calculation, which yet I do not ſee how better to be perform'd. I ſhall add a Table of the different Degrees of the Airs denſity at every 10 Degrees, from 130 above the Freezing Point, to 50 Degrees below it.

This Experiment was made *February* the 11th, 1708; the Mercury in the Barometer at the ſame time ſtanding at 30 Inches

	Degrees.	Parts.	
Above.	130	144	
	120	143	$\frac{1}{144}$
	110	142	$\frac{1}{72}$
	100	141	$\frac{1}{48}$
	90	140	$\frac{1}{38}$
	80	139	$\frac{1}{288}$
	70	138	$\frac{1}{24}$
	60	137	$\frac{1}{20,5}$
	50	136	$\frac{1}{18}$
	40	135	$\frac{1}{16}$
	30	134	$\frac{1}{14,4}$
	20	133	$\frac{1}{13,09}$
	10	132	$\frac{1}{12}$
Freezing Point.	0	131	$\frac{1}{11,08}$
Below.	10	130	$\frac{1}{10,3}$
	20	129	$\frac{1}{9,6}$
	30	128	$\frac{1}{9}$
	40	127	$\frac{1}{8,4}$
	50	126	$\frac{1}{8}$

This Table ſhews the Difference of the Airs Denſity at every 10 Degrees, from 130 above the Freezing Point, to 50 below it. As ſuppoſing the Spirit in the Thermometer ſhould ſtand at 40 Degrees above the Freezing Point; I find right againſt it in the third Column $\frac{1}{16}$: Its State being then ſo much more denſe than when the Spirit is elevated to 130 Degrees. And ſo of all the reſt.

The 2d Column ſhews the extent of the Air at the ſeveral Stations, from the Greateſt Heat, to the Greateſt Cold.